



## MARINE RECOVERY

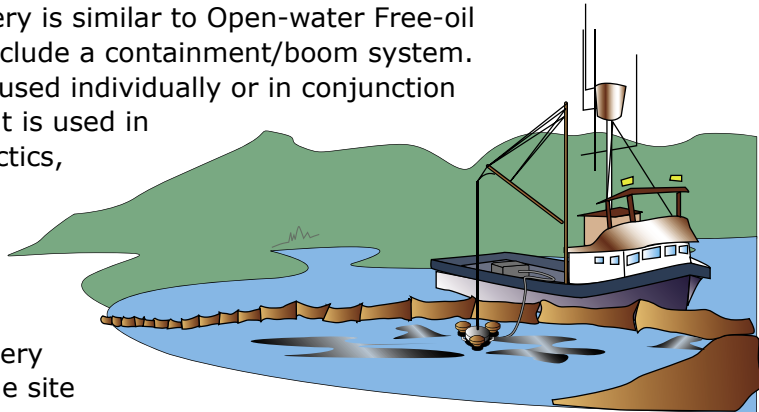
### OBJECTIVE & STRATEGY



The objective of Marine Recovery is to remove spilled oil that has been diverted or collected at a suitable recovery site accessible from the water. Marine Recovery is similar to Open-water Free-oil Recovery, but does not include a containment/boom system. Marine Recovery may be used individually or in conjunction with other tactics. When it is used in conjunction with other tactics, fewer personnel may be required.

The general strategy is to:

1. Identify the recovery site and assess the site conditions.
2. Determine the appropriate recovery and storage systems based on available equipment, oil type, site conditions and deployment vessel capabilities.
3. Mobilize and deploy equipment to recover and store the oil from the designated recovery site.
4. Man and monitor the system as appropriate.
5. Store and transfer recovered oil and oily water according to an approved waste management plan.



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### TACTIC DESCRIPTION

Marine Recovery systems are comprised of a skimming system, oil storage system, and associate vessels and personnel. Numerous types of recovery systems and primary oil storage devices are available to recover a variety of oils in various operating environments. Recovery system efficiency varies depending on oil type and encounter rates.

#### **Skimming Systems**

Marine Recovery requires at least one portable skimming system to remove spilled oil. The typical portable skimming system includes:

- Skimmer with pump and power pack
- Hose (suction and discharge with fittings)
- Oil transfer and decanting pump(s)
- Repair kit (tools and extra parts)

## Marine Recovery



There are many models of skimmers to choose from, but they all fall into three types:

- Weir skimmers** draw liquid from the surface by creating a sump in the water into which oil and water pour. The captured liquid is pumped from the sump to storage. The operator can usually adjust the working depth of the weir, controlling the rate that liquid is recovered. Weir skimmers can recover oil at high rates, but they can also recover more water than oil, especially when the oil is in thin layers on the surface of the water. This creates the need to separate the water from the oil and decant the water back into the environment. Otherwise, the recovered water will take up available storage volume. Weir skimmers are best employed where oil has been concentrated into thick pools or where there are very large volumes of oil and recovered liquid storage capacity. Avoid using centrifugal pumps to transfer liquids recovered by a weir skimmer, as this will cause the oil and water to emulsify; use a diaphragm pump instead.

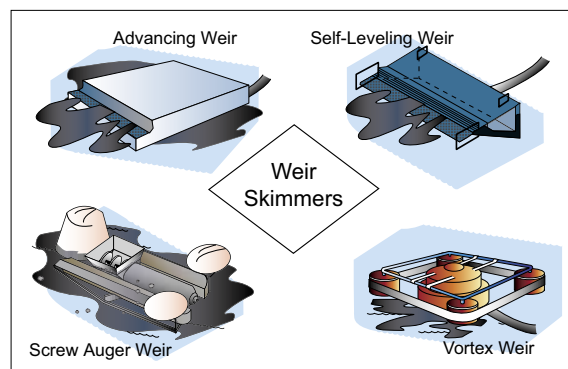


Figure MR-1. Various types of weir skimmers.

- Oleophilic skimmers** pick up oil that adheres to a collection surface, leaving most of the water behind. The oil is then scraped from the collection surface and pumped to a storage device. The collection surfaces in oleophilic skimming systems include rotating disks, brushes and drums, or continuous belts or ropes. Belt, brush and rope skimmers can be used in any type of oil, while disk and drum skimmers are best in fresh oil. Oleophilic skimmers do not recover oil as fast as weir skimmers, but they have the advantage of recovering very little water. Oleophilic skimmers may be used where oil is very thin on the surface.

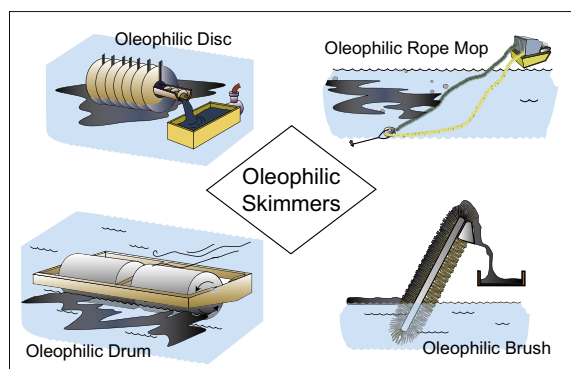


Figure MR-2. Various types of oleophilic skimmers.

- Suction skimmers** use a vacuum to lift oil from the surface of the water. These skimmers require a vacuum pump or air conveyor system. Like weir skimmers, suction skimmers may also collect large amounts of water if not properly operated. Most suction skimmers are truck mounted and work best on land. However, suction skimmers for the marine environment have been made by converting fish pumps to oil recovery purposes, or loading a vacuum truck on a vessel.



**Primary Oil Storage Devices**

Primary oil storage devices for the marine environment can be tanks, bladders, drogues, or barges. There are two categories of portable oil storage devices to choose from: onboard storage and towable on-water storage. Onboard oil storage systems can be on deck or below deck, but both types are subject to numerous US Coast Guard regulations and should only be used when approved by a Coast Guard inspector. Towable on-water storage is the preferred method for Marine Recovery. Towable on-water storage devices include: mini-barges, bladders, drogues, and open storage devices.

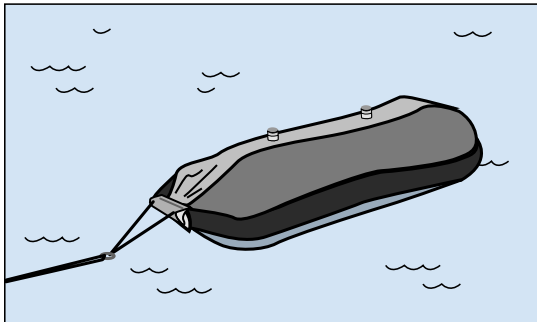


Figure MR-3. Towable, flexible storage device.

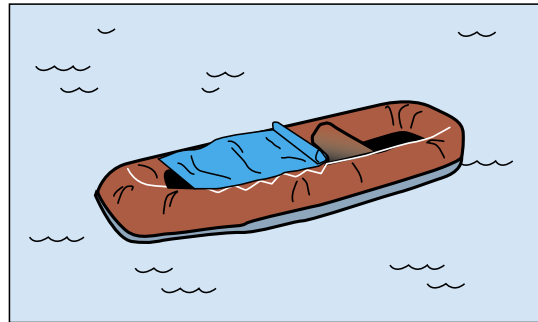


Figure MR-4. Towable open storage device.

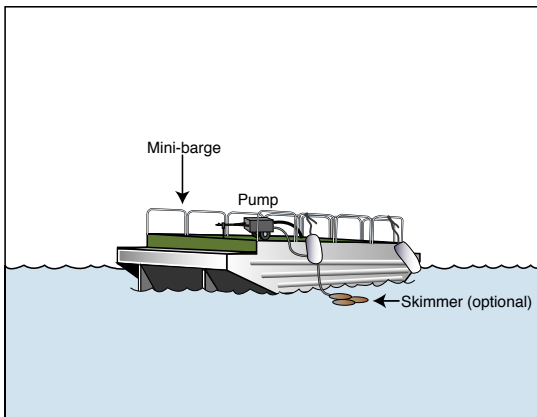


Figure MR-5. Towable Mini-barge storage device.

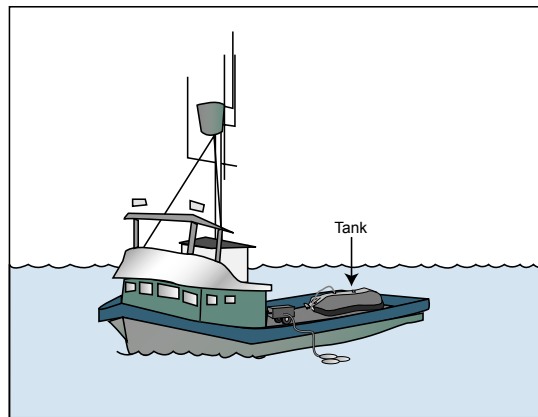


Figure MR-6. Deck tank primary storage device.

**Vessels**

Access to recovery sites is often restricted to shallow draft vessels due to proximity of the shore and water depths at low tide. The water depth, including area of maneuverability, should be considered in selection of vessels and storage systems. The size of recovery and storage devices varies and needs to be considered when matching with the deployment vessel. Capability of the vessel to lift and deploy the recovery devices, and to handle the storage devices in shallow water and possibly fast currents should also be considered.



## Marine Recovery

### Operating Environments



#### OPEN WATER

Marine recovery system components (vessels, skimmers, and storage devices) for open water operations should be able to withstand seas up to 6 feet and winds up to 30 knots. For safety, vessels should be able to transit higher seas from the recovery location to protected waters.



#### PROTECTED WATER

Vessels, skimmers and storage devices for protected water marine recovery systems should be able to withstand seas up to 3 feet and in winds up to 25 knots. Vessels deploying marine recovery systems in the protected water environment may be deep draft or shallow draft, depending on the water depth.



#### CALM WATER

Calm water marine recovery systems are composed of vessels, skimmers, and primary storage devices that can operate in seas of 1 foot and in winds up to 15 knots. Vessels deploying calm water marine recovery systems typically work in depths as shallow as 3 feet.



#### FAST WATER

Marine Recovery in fast water is difficult and not recommended if it is possible to divert the oil into calm water. Fast water marine recovery systems are designed to operate in moving water where the current exceeds 0.8 knots. This includes rivers and areas with significant tidal current. An oil concentrator/accumulator device, such as a Current Buster™ or River Circus™, may be useful for recovery systems in fast water. Vessels and skimmers used in tidal waters should be able to deploy and operate in seas up to 1 foot and in winds up to 15 knots. Vessels, boom, and skimmers used in river waters should be able to deploy and operate in waves up to 2 feet and in winds up to 15 knots. Fast water marine recovery systems are usually deployed from small vessels or skiffs.



#### BROKEN ICE

Marine recovery systems may be useful in the broken ice environment, where the ice serves to contain and concentrate oil in leads. However, the vessels and storage systems used must be appropriate for an ice environment. Flexible towable oil storage devices should not be used.

### Deployment Configurations

Typical configurations are shown on the next page, but responders should consider the actual conditions, and modify their deployment accordingly.





## Marine Recovery

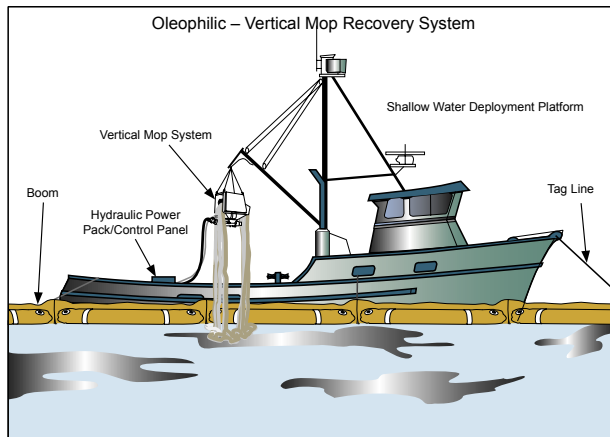


Figure MR-7. Vertical mop recovery system.

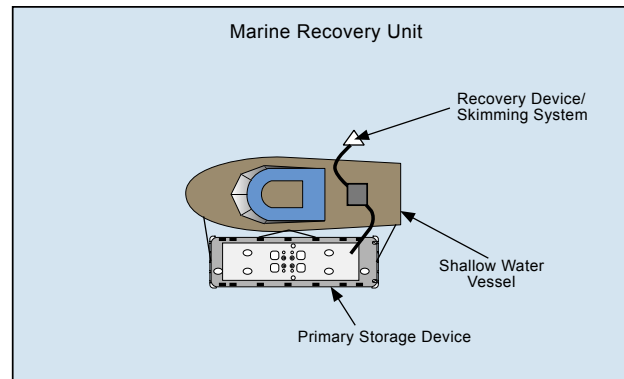


Figure MR-8. Typical Marine Recovery System

### DEPLOYMENT CONSIDERATIONS AND LIMITATIONS

#### SAFETY

- Consider vessel stability when placing equipment and recovered liquids onboard any vessel.
- Daily fair and foul weather evaluations are recommended, and should include distance to safe harbor and transit times.
- Vessel masters should have experience in the appropriate operating environment. Local knowledge is preferred.
- Vessel master should use extreme caution when maneuvering primary storage devices around submerged rocks.
- Vessels setting and tending the skimmers and storage devices should be able to safely transit seas which exceed this equipment's operating limitation.

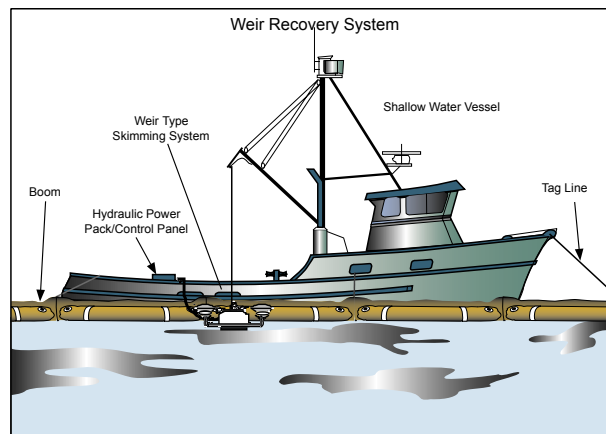


Figure MR-9. Weir recovery system.

#### DEPLOYMENT

- Water depth and oil type may influence equipment options.
- Recovery vessels should coordinate closely with Diversion Booming units.
- Constant monitoring of system efficiency is required.
- Procedure to decant should be considered; a permit is required to decant.

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# Marine Recovery



## REFERENCES TO OTHER TACTICS

Other tactics associated with marine recovery include:



• Diversion Boom



• Shoreside Recovery



• On-water Free-oil Recovery

## EQUIPMENT AND PERSONNEL RESOURCES

Commonly used resources for this module have been defined as a recovery system, a storage device, and a deployment vessel along with the associated support personnel, equipment, and materials. Quantity of units required will be determined by operating environment, site conditions, and resource availability.

### Open Water Marine Recovery System



Typical Equipment	Function	Quantity	Notes
Open water rated skimming system	Recover oil	1	Includes power pack, hoses, fittings and rigging
Primary oil storage system(s)	Store recovered oil	2 times the effective daily recovery capacity of the skimming system(s)	Depending on configuration, currents, and sea states
Decanting System	For removing recovered water	1 minimum	Permit is required to decant
Typical Vessel	Function	Quantity	Notes
Class 1, 2, or 3 Crane is recommended	Platform for skimming and handling oil storage device	1	Depending on configuration, currents, and sea states
Typical Personnel	Function	Quantity	Notes
Field Team Leader	Supervise operations	1	
Vessel Operators, Open water	Masters of response vessels	1 to 2	Depending on recovery system and hours of operation
Skilled Technicians	Crews vessels and operates response equipment	1 to 2	Depending on recovery system and hours of operation
General Technicians	Work under the direction of skilled technicians or vessel operators	2 to 4	Depending on recovery system and hours of operation

### Protected Water Marine Recovery System



Typical Equipment	Function	Quantity	Notes
Protected water rated skimming system	Recover oil	1	Includes power pack, hoses, fittings and rigging
Primary oil storage system(s)	Store recovered oil	2 times the effective daily recovery capacity of the skimming system(s)	Depending on configuration, currents, and sea states
Decanting System	For removing recovered water	1 optional	Permit is required to decant
Typical Vessel	Function	Quantity	Notes
Class 3, 4, or 5 Crane is recommended	Platform for skimming and handling oil storage device	1	Depending on configuration, currents, and sea states
Typical Personnel	Function	Quantity	Notes
Field Team Leader	Supervise operations	1	
Vessel Operators, Open water	Masters of response vessels	1 to 2	Depending on recovery system and hours of operation
Skilled Technicians	Crews vessels and operates response equipment	1 to 2	Depending on recovery system and hours of operation
General Technicians	Work under the direction of skilled technicians or vessel operators	0 to 2	Depending on recovery system and hours of operation



**Marine Recovery*****Calm Water Marine Recovery System***

Typical Equipment	Function	Quantity	Notes
Calm water rated skimming system	Recover oil	1	Includes power pack, hoses, fittings and rigging
Primary oil storage system(s)	Store recovered oil	2 times the effective daily recovery capacity of the skimming system(s)	Depending on configuration, currents, and sea states
Decanting System	For removing recovered water	1 optional	Permit is required to decant
Typical Vessel	Function	Quantity	Notes
Class 3, 4, 5, or 6	Platform for skimming and handling oil storage device	1 to 3	Depending on configuration, currents, and sea states
Typical Personnel	Function	Quantity	Notes
Field Team Leader	Supervise operations	1	May not always be on-site
Vessel Operators, Open water	Masters of response vessels	1 to 3	Depending on number of vessels
Skilled Technicians	Crews vessels and operates response equipment	2 to 3	Depending on number of vessels, configuration, recovery system
General Technicians	Work under the direction of skilled technicians or vessel operators	2 to 8	Depending on number of vessels, configuration, recovery system

***Fast Water Marine Recovery System***

Typical Equipment	Function	Quantity	Notes
Fast water rated skimming system	Recover oil	1	Includes power pack, hoses, fittings and rigging
Primary oil storage system(s)	Store recovered oil	Equal to the effective daily recovery capacity of the skimming system	Depending on configuration, currents, and sea states
Decanting System	For removing recovered water	1 optional	Permit is required to decant
Enhanced recovery device	Concentrate oil to improve skimming efficiency	1 optional	May be part of the booming system
Typical Vessel	Function	Quantity	Notes
Class 4, 5, or 6	Platform for skimming and handling oil storage device	1	Depending on configuration, currents, and sea states
Typical Personnel	Function	Quantity	Notes
Field Team Leader	Supervise operations	1	May not always be on-site
Vessel Operators, Open water	Masters of response vessels	1 to 2	Depending on number of vessels
Skilled Technicians	Crews vessels and operates response equipment	1 to 2	Depending on number of vessels, configuration, recovery system
General Technicians	Work under the direction of skilled technicians or vessel operators	1 to 4	Depending on number of vessels, configuration, recovery system

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# Marine Recovery



## Broken Ice Marine Recovery System

Typical Equipment	Function	Quantity	Notes
Protected/calm water rated skimming system	Recover oil	1	Includes power pack, hoses, fittings and rigging
Primary oil storage system(s)	Store recovered oil	2 times the effective daily recovery capacity of the skimming system	Depending on configuration, currents, and sea states
Decanting System	For removing recovered water	1 optional	Permit is required to decant
Typical Vessel	Function	Quantity	Notes
Class 1, 2 or 3	Platform for skimming and handling oil storage device	1	Must be rated to work in broken-ice
Typical Personnel	Function	Quantity	Notes
Field Team Leader	Supervise operations	1	
Vessel Operators, Open water	Masters of response vessels	1 to 2	Depending on hours of operations
Skilled Technicians	Crews vessels and operates response equipment	1 to 3	Depending on hours of operations
General Technicians	Work under the direction of skilled technicians or vessel operators	2 to 4	Depending on hours of operation and configuration of recovery system

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